



Energy Efficiency Standards for Computer Monitors

July 1, 2019 Effective Date



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Topics and Goals of this Presentation



- **Scope of the Regulations**
- **Definitions**
- **Test Procedure**
- **Performance Standards**
- **Marking Requirements**
- **Certification Requirements**



Scope. Computer Monitors

In California there are more than **25 million** computer monitors.



Statewide, computer monitors consume about **1,527 gigawatt hours** of electricity per year.

Regulating computer monitors will save about **696 gigawatt-hours** per year statewide.

Computer monitors contribute to a **peak demand** of almost **206 megawatts**.

Greenhouse gas emission reductions of **0.218 million metric tons of carbon dioxide** after the existing stock is replaced.



Scope. Computer Monitors

- 17 inch \leq Diagonal Screen Size \leq 61 inch
- Pixel density of 5000 pixels per square inch or greater

Includes:

- Analog or digital device
- Enhanced Performance Displays
- Gaming monitors
- Curved monitors
- Organic Light-Emitting Diode (OLED) monitors

Does not include:

- Televisions or signage displays





Definitions. Title 20 section 1602(w)

“Enhanced-performance display (EPD)” means a computer monitor that has **all of the following** features and functionalities:

- (1) A **contrast ratio of at least 60:1** measured at a horizontal viewing angle of at least 85°, with or without a screen cover glass;
- (2) A **native resolution equal to or greater than 2.3 megapixels (MP)**;
- (3) A **color gamut size of at least sRGB** as defined by *IEC 61966-2.1:1999*. Shifts in color space are allowable as long as 99 percent or more of defined sRGB colors are supported.



Definitions. Title 20 section 1602(w) cont'd.

“Gaming monitor” means a computer monitor that is **capable of adjusting the monitor refresh rate with the frame rate of the video content, and supports a continuously variable refresh rate** ranging across a factor of **at least 1.75 times** the minimum supported (for example a variable refresh rate of at least 40Hz to 70Hz if the minimum supported refresh rate is 40Hz); the monitor may include an incremental hardware-based assistance.



Definitions. Title 20 section 1602(w) cont'd.

“Very high performance monitor” means a computer monitor that meets **all of the following** criteria:

- (1) Has a diagonal screen size of 27 inches or greater;
- (2) Has a native resolution equal to or greater than either 3840x2160 pixels or 8.29 megapixels;
- (3) Has a color space greater than 99 percent of defined Adobe RGB color or greater than 99 percent of Digital Cinema Initiative (DCI)-P3 colors; and
- (4) Has a contrast ratio of at least 60:1 measured at a horizontal viewing angle of at least 85°, with or without a screen cover glass.



Definitions. Title 20 section 1602(w) cont'd.

“Keyboard, video, and mouse (KVM)” or **“keyboard, mouse, and monitor (KMM)”** means a computer monitor that can operate with a KVM switch and is designed to be used in a server rack for use solely in a data center.

“Organic light-emitting diode (OLED) monitor” means a monitor in which the emissive electroluminescent layer of the light-emitting diode is a film of organic compound that emits light in response to an electric current.

“Medical computer monitor” means a computer monitor that meets the definition of a device contained in Section 210(h) of the Federal Food, Drug, and Cosmetic Act (21 U.S.C. § 321(h)) and is listed and approved as such by the U.S. Food and Drug Administration.



Definitions. Title 20 section 1602(w) cont'd.

“Computer monitor off mode” means the computer monitor is connected to a power source, produces no visual information, and cannot be switched into any other mode with a remote control unit, an internal signal, or an external signal.

“Computer monitor sleep mode” means a low-power mode in which the computer monitor provides one or more non-primary protective functions or continuous functions.



Questions?





Test Procedure

Title 20 § 1604(v)

Performance Standards

Title 20 § 1605.3(v)





Test Procedure. Title 20 section 1604(v)

The test procedure for computer monitors is the **ENERGY STAR Program Requirements for Displays, Final Test Method (September 2015)**, with the following modifications:

(A) [On mode](#) measurements shall be made using the **IEC 62087: 2011**. The [computer monitor sleep mode](#) and [computer monitor off mode](#) measurements shall be made using the **IEC 62301:2011**, as specified in the **ENERGY STAR Program Requirements for Displays, Final Test Method (September 2015)**.

(B) A [computer monitor](#) shall be tested as required by the test procedure for the power draw in each of the following modes:

1. On Mode
2. Computer monitor Sleep Mode
3. Computer monitor Off Mode



Test Procedure. Title 20 section 1604(v) cont'd.

The test procedure for computer monitors is the **ENERGY STAR Program Requirements for Displays, Final Test Method (September 2015)**, with the following modifications:

- (C) Product features and functions not specifically addressed by the test method shall be turned off or disconnected. Built-in speakers shall be muted or turned down to their lowest volume setting for the on mode power draw test.
- (D) Before starting the test procedure for measuring on mode power draw, any feature unrelated to the display of images (for example USB hubs, webcams, speakers, LAN connections, and SD card readers) shall be turned off.



Performance Requirements Overview

- **On Mode power consumption limit** is a set of formulas based on the diagonal screen size, resolution, and screen area (**Table V-4**).
- **Computer monitor's Sleep and Off Modes** combined must consume less than or equal to **1.2 Watts**.
- **Allowances** are provided for enhanced performance displays (EPDs), curved, OLED, touch, and gaming features. Monitors with multiple features may combine allowances.



Efficiency Standards. Title 20 section 1605.3(v)(4)

Computer monitors manufactured on or after **July 1, 2019**, shall comply with all of the following:

- (A) The [computer monitor](#) on-mode power draw **shall be less than or equal to** the following equation with each of the applicable allowances applied at most **once**:

$$E_{on} \leq (E_{on_max} + E_{EP} + E_{Game} + E_{OLED} + E_{Curve})$$

Where:

E_{on} is the computer monitor on-mode power draw in watts as determined under Section 1604(v)(3) of this Article,

E_{on_max} is the maximum on-mode power draw in watts as determined by **Table V-4**,

E_{EP} is the **enhanced performance display** allowance in watts as determined in **Table V-5**,

E_{Game} is the [gaming monitor](#) allowance in watts as determined in **Table V-5**,

E_{OLED} is the [OLED](#) monitor allowance in watts as determined in **Table V-5**, and

E_{Curve} is the **curved monitor** allowance in watts as determined in **Table V-5**.



Efficiency Standards. Title 20 section 1605.3(v)(4) cont'd.

Table V-4
Power Consumption Standards for Computer Monitors

<i>Resolution in megapixels (MP)</i>	<i>Diagonal Screen Size (d) in Inches</i>	<i>Maximum Computer Monitor On Mode Power Consumption in Watts</i>
<i>≤ 5.0 MP</i>	<i>17" ≤ d ≤ 20"</i>	<i>[(6.0*r) + (0.025*A) + 3.7]</i>
	<i>20" < d < 23"</i>	<i>[(4.2*r) + (0.02*A) + 2.2]</i>
	<i>23" ≤ d < 25"</i>	<i>[(4.2*r) + (0.04*A) – 2.4]</i>
	<i>25" ≤ d < 30"</i>	<i>[(4.2*r) + (0.07*A) – 10.2]</i>
	<i>30" ≤ d ≤ 61"</i>	<i>[(6.0*r) + (0.1*A) – 14.5]</i>
<i>> 5.0 MP</i>	<i>17" ≤ d ≤ 20"</i>	<i>[25 + (0.025*A) + 3.7]</i>
	<i>20" < d < 23"</i>	<i>[25 + (0.02*A) + 2.2]</i>
	<i>23" ≤ d < 25"</i>	<i>[25 + (0.04*A) – 2.4]</i>
	<i>25" ≤ d < 30"</i>	<i>[25 + (0.07*A) – 10.2]</i>
	<i>30" ≤ d ≤ 61"</i>	<i>[25 + (0.1*A) – 14.5]</i>
Where: "A" is the monitor screen area in square inches "d" is the diagonal measurement of the display in inches "r" is the megapixel resolution of the display		



Efficiency Standards. Title 20 section 1605.3(v)(4) cont'd.

Table V-5
List of Potentially Applicable Allowances

Allowance	Computer Monitor Type	Models manufactured on or after July 1, 2019, and before January 1, 2021	Models manufactured on or after January 1, 2021
EEP	Enhanced Performance Display with a color gamut support of 32.9% of CIELUV or greater (99% or more of defined sRGB colors)	.3 * Eon_max	.2 * Eon_max
	Enhanced Performance Display with a color gamut support of 38.4% of CIELUV or greater (99% or more of defined Adobe RGB colors)	.75 * Eon_max	.6 * Eon_max
EGame	Gaming Monitors without incremental hardware-based assistance	.3 * Eon_max	.2 * Eon_max
	Gaming Monitors with incremental hardware-based assistance	.35 * Eon_max	.3 * Eon_max
EOLED	OLED monitor	.3 * Eon_max	.2 * Eon_max
ECurve	Curved Monitor	.3 * Eon_max	.2 * Eon_max



Efficiency Standards. Title 20 section 1605.3(v)(4) cont'd.

Computer monitors manufactured on or after **July 1, 2019**, shall comply with all of the following:

- A. Consume less than or equal to 1.2 watts in computer monitor Sleep Mode and computer monitor Off Mode power **combined**.
- B. Must be shipped with a screen luminance less than or equal to $200 \text{ cd/m}^2 \pm 35$ percent. A manufacturer may ship with additional features enabled, even if they were turned off in testing.
- C. Computer monitors with touch screen capability are allowed an additional 1 watt allowance per mode in modes where touch functionality is enabled



Efficiency Standards. Title 20 section 1605.3(v)(4) cont'd.

EXCEPTIONS to compliance with the efficiency standards in section

1605.3(v)(4): The following computer monitors are not required to comply with the computer monitor performance standards but shall comply with the test procedures in section 1604(v)(3), the certification requirements in section 1606, and the marking requirements in section 1607:

1. KVM [keyboard, video, and mouse].
2. KMM [keyboard, mouse, and monitor].
3. Very high performance monitors.

EXCEPTION to compliance with the efficiency standards in section

1605.3(v)(4): Medical computer monitors are not required to comply with section 1605.3(v)(4) or the test procedures in section 1604(v)(3) but shall comply with the **certification requirements** in section 1606 and the **marking requirements** in section 1607.



Marking. Title 20 section 1607

Title 20 section 1607 marking requirements apply to all covered appliances:

The following information shall be permanently, legibly, and conspicuously displayed on an accessible place on each unit;

- a) manufacturer's name or brand name or trademark (which shall be either the name, brand, or trademark of the listed manufacturer specified pursuant to section 1606(a)(2)(A);
- b) model number; and
- c) date of manufacture, indicating (i) year and (ii) month or smaller (e.g. week) increment. If the date is in a code that is not readily understandable to the layperson, the manufacturer shall immediately, on request, provide the code to the Energy Commission.



Questions?





CERTIFICATION PROCESS





Certification Process

A state or federally regulated new appliance sold or offered for sale in California, including via the internet, must be certified to the Energy Commission as compliant with the Title 20 Regulations. Compliance includes:

- Meeting the applicable efficiency standards
- Testing in a test lab approved by the Commission
- Marking each unit per Title 20 §1607
- Certifying each model to the Commission
- Model appears in the Commission's database



REPORTING REQUIREMENTS

TITLE 20 SECTION 1606

Products manufactured on or after the effective date must certify their compliance with the standards to the Energy Commission for lawful sale in California, including internet sales.

The effective date for computer monitors is July 1, 2019.



CERTIFICATION ASSISTANCE

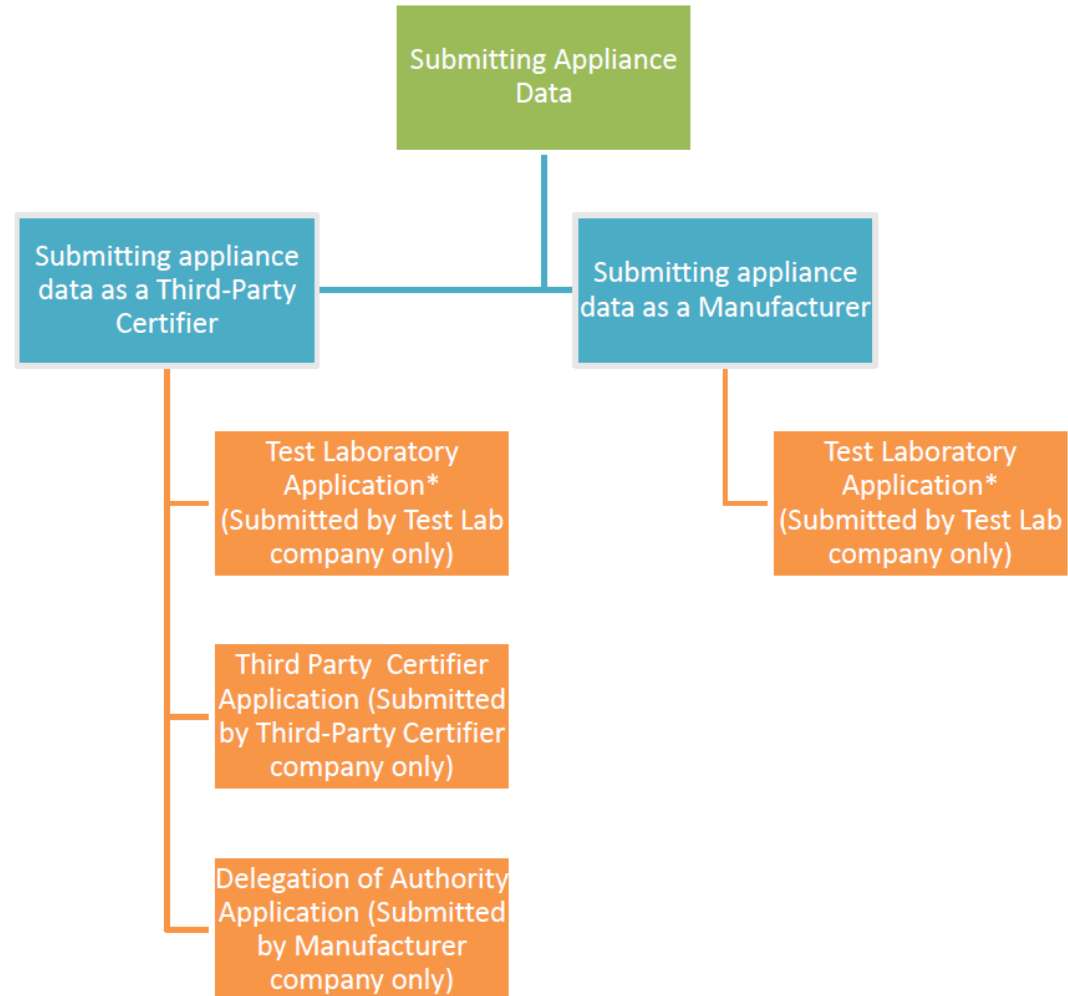
TITLE 20 SECTION 1606

The Appliances Office has many original and partner resources available at no cost to the public including a 12 part *on-demand* video tutorial on the certification process, recorded webinars, and detailed written instructions with comprehensive graphics that explain how to certify a model to the Commission's Modernized Appliance Efficiency Database System (MAEDbS).

Our **Title 20 Compliance Assistance Call Center** is also available business weekdays from 9:00 AM – 4:30 PM PT.



CERTIFICATION OVERVIEW



*If the manufacturer or third-party certifier is **only** deleting appliance data in their submission no test laboratory is required.



CERTIFICATION REQUIRES SIGNING A BINDING DECLARATION ON BEHALF OF YOUR COMPANY

Declaration

I declare under penalty of perjury of the laws of the State of California that:

1. All the information in this statement is true, complete, accurate, and in compliance with all applicable provisions of Sections 1601 – 1609 of Title 20 of the California Code of Regulations.
2. Units of each basic model of appliance for which certification is requested have been tested in accordance with all applicable requirements of Sections 1603 – 1604 of Title 20 of the California Code of Regulations.
3. Section 1606(g) of Title 20 of the California Code of Regulations have been and are being complied with.
4. All units manufactured, distributed or otherwise intended for sale within the State of California have been and are being marked as required by Section 1607 of Title 20 of the California Code of Regulations.
5. The (i) manufacturer's name or brand name or trademark; (ii) model number; and (iii) date of manufacture are permanently, legibly, and conspicuously displayed on an accessible place on each unit, on the unit's packaging, or, where the unit is contained in a group of several units in a single package, on the packaging of the group.
6. The appliance complies with the applicable energy efficiency, energy consumption, energy design, water efficiency, water consumption, and water design standards in Sections 1605.1, 1605.2, and 1605.3 of Title 20 of the California Code of Regulations.

*Name

*Title

*Date



Previous

Next



Title 20 § 1606 Table X- Section V
Computer Monitors Data Submittal Requirements

	<i>Appliance</i>	<i>Required Information</i>
V	Computer Monitors	Backlight Type
		EPD
		OLED
		Gaming Monitor w/ Incremental Hardware
		Gaming Monitor w/o Incremental Hardware
		KMM_KVM
		Very High Performance
		Curved Monitor
		Viewable Screen area (square inches)
		Screen size (diagonal inches)
		Automatic Brightness Control
		Automatic Brightness Control Enabled when Shipped
		Screen Luminance (Candelas Per Square Meter)
		Native Resolution (megapixels)
		Power Draw in On Mode (watts)
		Power Draw in Computer Monitor Sleep Mode (watts)
		Power Draw in Computer Monitor Off Mode (watts)
		Touch Screen Capability
		Touch Screen Enabled in On Mode
		Touch Screen Enabled in Computer Monitor Sleep Mode
		Touch Screen Enabled in Computer Monitor Off Mode
		Color Gamut
	Medical Computer Monitors	Other than the identifier information shown under “All Appliances” (e.g., manufacturer name, brand name, model number), no other data is required for medical computer monitors at this time.



Computer Monitors

[Save](#)[Cancel](#)

Instructions

- Key in appliance data according to associated fields in the import template provided in the instructions for this specific appliance type. If the appliance brand name does not appear in the dropdown, enter it in the free entry field, this will be added to the system after CEC staff processing.
- Model data must first be processed by CEC prior to any submissions to change or delete previously submitted model data.
- **Brand codes are not accepted.**

*Action

Please Select ▼

*Model Number

Manufacturer

Add Date

Brand

Please Select ▼

New Brand

*Regulatory Status

Please Select ▼

Backlight Type

Please Select ▼
C - CCFL - Cold-Cathode Fluorescent Light
L - LED
Q - Quantum Dots
N - None

Curved Monitor? (T/F)

None ▼

Enhanced Performance Display Monitor? (T/F)

None ▼

Keyboard, Mouse, and Monitor (can operate with a KVM switch)? (T/F)

None ▼

Very High Performance Monitor? (T/F)

None ▼

Gaming Monitor? (T/F)

None ▼

Incremental Hardware (Gaming Monitors Only)? (T/F)

None ▼





Touch Screen Capability? (T/F)

None



Touch Screen Enabled in Computer Monitor Sleep Mode? (T/F)

None



Automatic Brightness Control? (T/F)

None



Color Gamut

Please Select

A - <= 32.9% of CIE LUV

B - > 32.9% of CIE LUV (99% or more of defined sRGB colors)

C - > 38.4% of CIE LUV (99% or more of defined Adobe RGB colors)



Native Resolution (Megapixels)

Power Draw in Computer Monitor On Mode Standard

Power Draw in Computer Monitor Off Mode (Watts)

Allowance for Curved Monitor

Touch Screen Enabled in Computer Monitor On Mode? (T/F)

None



Touch Screen Enabled in Computer Monitor Off Mode? (T/F)

None



Automatic Brightness Control Enabled (when shipped)? (T/F)

None



Viewable Screen Area (Total Square Inches)

Screen Luminance (Candelas Per Square Meter)

Power Draw in Computer Monitor On Mode (Watts)

Power Draw in Computer Monitor Sleep Mode (Watts)

Power Draw in Computer Monitor Sleep Mode and Off Mode Standard

Allowance for OLED Monitor



RESOURCES

www.energy.ca.gov/appliances

Title 20 Appliance Efficiency Program



Regulations & Rulemakings

- » **Appliance Efficiency Regulations**
- » Current Appliance Efficiency Rulemakings
- » Historical Rulemakings



Outreach & Education

- » News, Fact Sheets, **FAQs**
- » Program Bulletins
- » **Webinar** Documents



Featured Links

- » Federally Regulated Battery Chargers, Regulatory Advisory
- » 2018 California Lighting Standards Information
- » Residential Pool Pump and Motor Combinations and Replacement Residential Pool Pump Motors, Regulatory Advisory



Upcoming Events

- » September 13, 2018
Webinar: Energy Efficiency Regulations for Notebook Computers
- » September 19, 2018
Webinar: Energy Efficiency Regulations for Desktop Computers

RESOURCES

Title 20 Compliance Assistance listserv

<http://www.energy.ca.gov/efficiency/listservers.html>

Webinar documents / How to certify to MAEDbS

<http://www.energy.ca.gov/appliances/forms/index.html#webdocs>

Title 20 Compliance Assistance Call Center

Toll free inside California **(888) 838-1467**

From outside of California **(916) 651-7100**

appliances@energy.ca.gov





RESOURCES

Today's Webinar Documents

www.energy.ca.gov/appliances/forms/webnr_documents

Computer FAQs

[www.energy.ca.gov/appliances/documents/computers and displays regulation FAQ.html](http://www.energy.ca.gov/appliances/documents/computers_and_displays_regulation_FAQ.html)

Title 20 Appliance Efficiency Regulations

www.energy.ca.gov/appliances

Title 20 Compliance Assistance Call Center

From outside of California **(916) 651-7100**

appliances@energy.ca.gov

Title 20 Compliance Assistance listserv

www.energy.ca.gov/efficiency/listservers.html



Definitions. Title 20 section 1602(w)

“**Computer monitor**” means an analog or digital device of size greater than or equal to 17 inches and less than or equal to 61 inches, that has a pixel density of greater than 5000 pixels per square inch, and that is designed primarily for the display of computer generated signals for viewing by one person in a desk-based environment. A computer monitor is composed of a display screen and associated electronics.

A computer monitor **does not** include:

- (1) Displays with integrated or replaceable batteries designed to support primary operation without AC mains or external DC power, (e.g., electronic readers, mobile phones, portable tablets, battery-powered digital picture frames);
- (2) A television or a signage display.